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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/925,626	08/10/2001	Fumihito Oka	3008-34	2918

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EXAMINER	
HU, SHOUXIANG	
ART UNIT	**PAPER NUMBER**
2811	16

DATE MAILED: 12/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/925,626	OKA ET AL.	
	Examiner	Art Unit	
	Shouxiang Hu	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 October 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13 and 17-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13 and 17-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Objections

1. Claims 17-20 are objected to because of the following informalities/defects:

In claim 17, line 7, the term of "crystallize" should read as: --being crystallized--.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

3. Claims 1, 3-5, 7 and 17-20, as being best understood in view of the claim rejections above, are rejected under 35 U.S.C. 102(a) as being anticipated by Guliants et al. ("Guliants"; Photovoltaic Specialists Conference, 15-22 September 2000, IEEE, pages 154-157).

Guliants discloses a crystalline silicon thin film semiconductor device that can function as a photovoltaic device (see Fig. 5), comprising: a conductive substrate (Mo; see the first paragraph in the EXPERIMENT section); a crystallographically oriented first polysilicon layer (the lower portion of the MI-grown n-type polysilicon layer; see the bottom-right paragraph at page 156 through the top-left paragraph at page 157); and a second polysilicon layer (the upper portion of the MI-grown n-type polysilicon layer),

wherein the first polysilicon layer is crystallographically oriented and has been formed by introducing a metal catalyst (the Ni film) so as to come in contact with a surface portion of an amorphous silicon layer (the precursor of the lower portion of the MI-grow n-type polysilicon layer) and through heat treatment; the second polysilicon layer inherently has been formed by following the crystallographic orientation of the first polysilicon layer, as the first polysilicon layer is closer to the catalyst film and is crystallized first, which accordingly can inherently function as a seed layer for the crystallization of the second polysilicon layer; and the first and second polysilicon layers have a same first conductivity type (n-type). And, the formation of the second polysilicon layer can be regarded as being without catalytic effect in the sense that the second polysilicon is separated from the metal catalyst by the first polysilicon layer during the formation of the second polysilicon layer. In addition, it is noted that the limitation regarding the second polysilicon layer being formed "without catalytic effect" is a process limitation, which would not carry patentable weight in the claim(s) drawing to a structure, because distinct structure is not necessarily produced. In re Thorpe, 227 USPQ 964, 966 (Fed. Cir. 1985). Furthermore, the limitations regarding how the first polysilicon is formed, more specifically regarding which one of the amorphous silicon layer and the metal catalyst element is in contact with the substrate, as recited in claim 1 (lines 5-6) and claim 17 (lines 3-5), is a process limitation, which would not carry patentable weight in the claim(s) drawing to a structure, because distinct structure is not necessarily produced. In re Thorpe, 227 USPQ 964, 966 (Fed. Cir. 1985). In both cases, there is no metal catalyst remaining between the first and second polysilicon

layers, otherwise, the second polysilicon layer would be formed directly under the catalyst effect.

Regarding claim 3, the second polysilicon layer is formed through columnar growth, which is therefore inherently crystallographically oriented in its thickness direction.

Regarding claims 4 and 7, the thin film semiconductor device of Guliants further includes a third polysilicon layer (the p-type layer in the p-n junction diode structure), which has a same crystallographic orientation as the first and second polysilicon layers.

Regarding claims 17-21, the limitations regarding how the second polysilicon layer is formed, as recited in claims 18-20, are also process limitations, which would not carry patentable weight in the claim(s) drawing to a structure, because distinct structure is not necessarily produced. In re Thorpe, 227 USPQ 964, 966 (Fed. Cir. 1985).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claim 2, as being best understood in view of the claim rejections above, is rejected under 35 U.S.C. 103(a) as being unpatentable over Guliants et al. ("Guliants"; Photovoltaic Specialists Conference, 15-22 September 2000, IEEE, pages 154-157).

The disclosure of Guliants is discussed as applied to claims 1, 3-5, 7 and 17-20 above.

Guliants further discloses that the second polysilicon layer is formed in a gas mixture comprising hydrogen (see the first paragraph in the EXPERIMENT section).

Although Guliants does not expressly disclose that the second polysilicon layer can contain no less than 0.1% hydrogen, one of ordinary skill in the art would readily recognize that a polysilicon layer can preferably have a hydrogen concentration no less than 0.1% for improving its doping efficiency, as readily evidenced in the prior art such as Saito (US 2002/0011264 A1; see Section [0067]). And, it is further noted that the hydrogen concentration in a polysilicon layer is an art-cognized parameter of importance subject to routine experimentation and optimization.

Therefore, it would have been obvious to one of ordinary skilled in the art at the time the invention was made to make the thin film device of Guliants with the hydrogen concentration in the second polysilicon layer being no less than 0.1%, so that a thin film device with improved doping efficiency and optimized performance would be obtained.

6. Claim 6 and 8-13, as being best understood in view of the claim rejections above, are rejected under 35 U.S.C. 103(a) as being unpatentable over Guliants et al. ("Guliants"; Photovoltaic Specialists Conference, 15-22 September 2000, IEEE, pages 154-157) in view of Okamoto et al. ("Okamoto"; 6,337,224).

The disclosure of Guliants is discussed as applied to claims 1-5, 7 and 17-20 above.

Guliants further discloses that the substrate can also be a glass.

Although Guliants does not expressly disclose that the thin film device can further include a substantially i-type fourth polysilicon layer, and/or a top and/or a bottom electrode, one of ordinary skill in the art would readily recognize that an i-type polysilicon layer can be inserted in the middle to form a p-i-n type photovoltaic device for improving efficiency, and that a top and a bottom electrodes are desirable for reducing the contact resistance of a photovoltaic device, a evidenced in Okamoto (see the i-type layer 205, the top and bottom electrodes 207 and 210 in Fig. 1).

Therefore, it would have been obvious to one of ordinary skilled in the art at the time the invention was made to make the thin film device of Guliants with device further comprising a substantially i-type fourth polysilicon layer and/or a top electrode and/or a bottom electrode, as taught in Okamoto, so that a photovoltaic device with improved efficiency and/or reduced contact resistance would be obtained. And, the fourth polysilicon layer in such a device would inherently have a same crystallographic orientation as the third polysilicon layer, provided it is formed through the same way the third polysilicon layer in Guliants is formed.

Regarding claim 10, one of ordinary skill in the art would readily recognize that a polysilicon layer can preferably have a hydrogen concentration no less than 0.1% for improving its doping efficiency, as readily evidenced in the prior art such as Saito (US 2002/0011264 A1; see Section [0067]). And, it is further noted that the hydrogen concentration in a polysilicon layer is an art-cognized parameter of importance subject to routine experimentation and optimization.

Therefore, it would have been obvious to one of ordinary skilled in the art at the time the invention was made to make the thin film device collectively taught by Guliants and Okamoto with the hydrogen concentration in the third and the fourth polysilicon layers being no less than 0.1%, so that a thin film device with optimized performance would be obtained.

Response to Arguments

Applicant's arguments filed on 10/06/03 have been fully considered but they are not persuasive.

Applicant's main arguments include: Guliants does not disclose the limitation that the first polysilicon layer is formed by forming the amorphous silicon layer, not the metal catalyst layer, on the substrate. In response, it is noted that the word "on" does not always necessarily have to be interpreted as meaning: on and in direct contact with. Besides, as already explained in the claim rejections set forth above in this Office action, the "forming" limitation is a process limitation, which would not carry patentable weight in the claim(s) drawing to a structure, because distinct structure is not necessarily produced. In re Thorpe, 227 USPQ 964, 966 (Fed. Cir. 1985). In each of cases (both in Guliants and in the instant invention), both of the first and second polysilicon layers (or portions) are crystallographically oriented along a same direction, and there is no metal catalyst element remaining between them. If Applicant believes that a distinct structure feature(s) is/are indeed produced with the recited process limitations, Applicant then should clearly define such distinct structure feature(s) in the

claim(s). And, Applicant is reminded that although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

In addition, it is further noted that, in Guliants, the first polysilicon layer (the lower portion of the MI-grown n-type polysilicon layer; see the bottom-right paragraph at page 156 through the top-left paragraph at page 157) is first crystallographically oriented with the use of a underlying metal catalyst (the Ni film); and the second polysilicon layer (the upper portion of the MI-grown n-type polysilicon layer) is naturally formed by following the crystallographic orientation of the first polysilicon layer without catalytic effect, in the sense that the second polysilicon layer has no direct contact with the metal catalyst as they are separated from each other by the first polysilicon layer.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is (703) 306-5729. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (703) 308-1690. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9318.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

SH
December 11, 2003

SHOUXIANG HU
PRIMARY EXAMINER